

DISCOVERY

To Cite:

Motalib JM. Socio-Economic impact assessment of Agus-1 hydroelectric power plant in Marawi city, Philippines: A case study. *Discovery* 2023; 59: e105d1038

Author Affiliation:

Faculty, Department of Civil Engineering, Mindanao State University, Marawi city, Philippines
Email: jalalmotalib04@gmail.com

Peer-Review History

Received: 03 June 2023
Reviewed & Revised: 07/June/2023 to 10/July/2023
Accepted: 13 July 2023
Published: August 2023

Peer-Review Model

External peer-review was done through double-blind method.

Discovery
pISSN 2278-5469; eISSN 2278-5450



© The Author(s) 2023. Open Access. This article is licensed under a [Creative Commons Attribution License 4.0 \(CC BY 4.0\)](http://creativecommons.org/licenses/by/4.0/), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

Socio-Economic impact assessment of Agus-1 hydroelectric power plant in Marawi city, Philippines: A case study

Jalaloden M Motalib

ABSTRACT

Basically, the construction of Agus-1 where it utilized the Lake Lanao as its reservoir, had affected the way of living of the Maranao people settling around shore of Lake Lanao, particularly in Marawi city as its host community. This study examines the socio-economic impact of Agus-1 hydroelectric power plant on the surrounding community. The purpose of the study is to identify the positive and negative impacts of the hydroelectric power plant on the community, and to provide recommendations for mitigating any negative impacts. The study is based on a case study of a hydroelectric power plant in a rural community in Marawi city, Philippines. The study found that the Agus-1 hydroelectric power plant had a number of positive impacts on the community, including job creation, increased economic activity, and improved infrastructure. However, the study also identified a number of negative impacts, including environmental degradation, displacement of local communities, and social disruption. The study recommends a number of strategies for mitigating the negative impacts of the hydroelectric power plant. These strategies include: developing compensation packages for affected communities, implementing environmental management plans, and improving communication and consultation with local communities.

Keywords: Socio-Economic Impact, Agus-1 Hydroelectric Power plant, Impact Assessment

1. INTRODUCTION

Hydroelectric power plants are a popular source of renewable energy. They generate electricity by converting the energy of falling water into electrical energy. Hydroelectric power plants have a number of advantages over other sources of energy, including their reliability, efficiency, and environmental friendliness. However, the construction and operation of hydroelectric power plants can also have significant socio-economic impacts on the surrounding community. In late 1960's in some part of the globe, big dams were being

removed because some of its social, economic and environmental costs are becoming unacceptable. Thus, the sustainability of hydropower dams is most usually insufficiently scrutinized by stakeholders.

Typically, the primary objective of constructing hydropower dams is to generate electricity, catering to the increasing demands of industrial and urban sectors. These things often overwhelm social, economic, and environmental considerations leaving behind the local communities who were saddled with socio-economic and environmental costs and deterioration of social status. The construction of hydropower dams gives rise to significant socio-economic challenges. Communities residing near downstream areas of these dams face jeopardized living conditions and food security. The immediate aftermath often witnesses a drastic decline of up to 60% in fish catch, while the loss of fisheries, flood recession agriculture, and other natural resources profoundly impact thousands of individuals residing near the dam (Scudder, 2011).

When the construction of Agus-1 hydropower plant was finished and was then scheduled for final testing on October 1990, it was opposed by demonstrators of locals who resorted to legal means to stop the operation of the plant (Hansel and Metillo, 2016). Basically, the construction of Agus-1 where it utilized the Lake Lanao as its reservoir, had affected the way of living of the Maranao people settling around shore of Lake Lanao, particularly in Marawi city as its host community. Some social and economic risks caused by the Agus-1 hydroelectric plant are the following:

- a) Physical and Economic Displacement: The operation and maintenance of the Agus-1 hydroelectric Plant had caused the disruption of some properties affecting the daily life and chores of the people of the lake.
- b) Livelihood: Fishing is one of the main economic sources of the communities settling around lakeshore. However, the lake drawdown caused by the establishment of Agus-1 Hydropower plant had caused the disappearance of fisheries in the lake. In fact, power generation in Lake Lanao have led to the exposure of the littoral zone which have been detrimental for those fishes which use it as their breeding area (Hansel and Metillo, 2016).
- c) Natural source of irrigation: There was a deterioration of lake water source for irrigation due to hydropower generation in Lake Lanao. Since the quality of operation of hydro power generation depends on the gravity weight of the Lake Lanao, it is normal for National Power Corporation to keep and maintain the standard water level at its highest point as possible, causing the disruption of the source of irrigation for the rice fields and other agricultural seeds. People, who are in need of water supply system, were sneaking instead in channelling the river system as a source of irrigation. However, altering the Lake Lanao as the receiving body of river water consequently reduces the hydropower generator capacity of Lake Lanao for the Agus-1 hydropower plant. Thus, conflict of interests of the natural resource of water.

The purpose of the study is to identify the positive and negative impacts of the hydroelectric power plant on the community, and to provide recommendations for mitigating any negative impacts. This research relies on a case study conducted in Marawi City, Philippines, focusing on a hydroelectric power plant situated within a rural community. The study examines the socio-economic impact of Agus-1 hydroelectric power plant on the surrounding community. As these problems were treated to, the output of this study will help and motivate the authorities and National Power Corporation in making a compensation form through Policy regulations that promotes social and economic stewardship and strengthen communities and individuals affected by Agus-1 for decades.

Based on the findings of this study, policymakers and relevant authorities can use it as a credible foundation to invest in comprehending the social capital and historical background of these communities. Collaborating with these communities, they can strive to preserve the integrity of their social, economic, and political relationships. This study will also allow authorities use the findings to enforce potential solutions to the poor socio-economic programs and awareness programs of mandated agencies. The strategies generated as the output of this study can also improve the environmental stewardship during Agus-1 operations, increase the effectiveness of public services and public policy, and enhance quality of life.

2. METHODOLOGY

The study used a mixed-methods approach, combining both quantitative and qualitative data collection methods. The study employs a survey questionnaire to collect data from a sample of residents in the surrounding community. The survey questionnaire includes indicators on the socio-economic impacts of the hydroelectric power plant, as well as the respondents' perceptions of these impacts. In addition to the survey questionnaire, the study also employs semi-structured focus group discussions with key stakeholders, including representatives from the hydroelectric power plant, local government officials, and members of the affected community. The interviews are designed to gather in-depth information on the socio-economic impacts of the hydroelectric power plant and to develop strategy measures for mitigating negative impacts.

Respondents

This study aims to evaluate the impact of the Agus-1 Hydroelectric Power plant and develop strategic measures accordingly. To gather initial baseline information, the researcher conducted a Survey Questionnaire among two hundred (200) respondents residing in the vicinity of the hydroelectric power plant. Afterwards, additional valuable information was gathered through a Focus Group Discussion from Twenty (10) of the same respondents in the Survey Questionnaire. The survey respondents were selected randomly from the 96 barangays of Marawi City that fall within the coverage area of the Agus-1 hydroelectric power plant project.



Figure 1 Location of the respondents

Research Instruments

The following Research Instruments were used in this study:

- 1) Survey questionnaire: The survey questionnaire used in this study, which underwent validation by an expert, consisted of items designed to assess the socio-economic impact of the Agus-1 Hydroelectric Power plant.
- 2) Focus Group Discussion Interview Guide: Interview guide questions were used to elicit perceptions and responses from the respondents of the study as used in the Focus Group Discussion.

Procedure

This study utilized a survey checklist to collect information. The checklist underwent a validation process, including face validity and content validity through pilot testing. To prevent bias and ensure diverse participation, the Fishbowl or lottery sampling method was employed, which discouraged one-sided involvement from specific populations. To ensure fairness, the researcher wrote down the names of each barangay on slips of paper, folded them, and placed them in a fishbowl, providing equal opportunities for all barangays to participate. This approach facilitated the identification of survey locations, and the estimated time for respondents to complete the survey questionnaire was 10-15 minutes each.

The collected survey data were then tallied, tabulated, and analyzed to assess the impact of the Agus-1 Hydroelectric Power plant on the residents of surrounding communities and to propose strategic measures for policy output. The presentation of data was supported by insights derived from the focus group discussions and implications analyzed from the supporting data collected. Various socio-economic aspects such as settlement patterns, income, conflicts, provision of social services, land rights, and other relevant factors were examined and analyzed. The primary objective of this analysis was to formulate development strategies that would enhance the quality of life for the stakeholders of the Agus-1 phase.

3. RESULTS

An essential facet of assessing impact of Agus-1 Hydroelectric Power plant was to enhance indicators that will help to identify the status of the project implemented by the government, the progress made towards the project, the issue, challenges, and problems in moving towards those projects, and a measure adopted to face and address the problem and challenges.

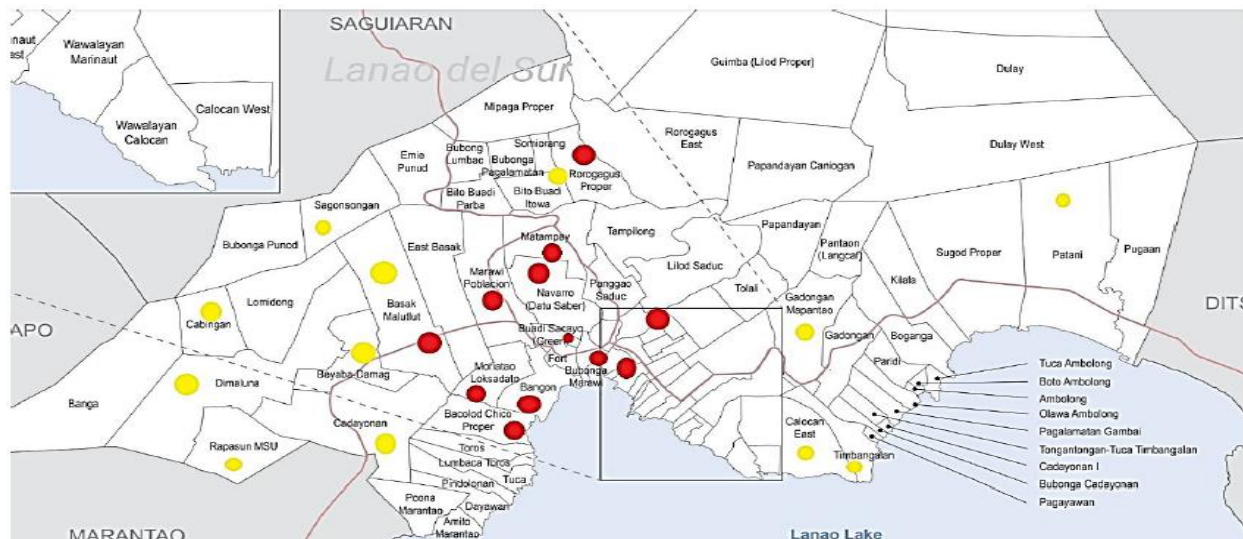


Figure 2 Geographic location of the Study Respondents

Respondent's Distribution

The subject barangays within the coastal area of Agus River were shaded with red circle and for those within the upland areas far from Agus River were shaded with yellow circle. The Distribution of the respondents per barangay were chosen using the fishbowl method where all barangays from coastal areas were listed in sheet of folded paper and were randomly selected in a fishbowl container. Thus, the same process was done with those from upland areas. Effendi, (2018), in his study of the speaking efficacy of students through the use of the fishbowl method, found out that the technique was effective in developing speaking efficacy among the respondents because of its nature of being chosen randomly. It was also found out that through unanimous opportunities to get involved of the sampling process, the respondents acquire that sense of self-efficacy.

Respondent's Distribution

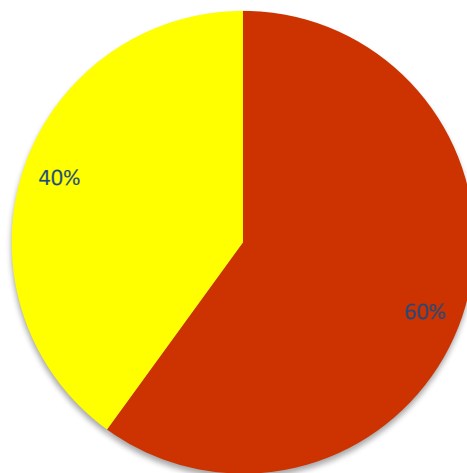


Figure 3 Pie Chart of the Respondents Distribution

The distribution of respondents in this study was divided into two categories: 60% from coastal areas and 40% from upland areas. The decision was made to include a larger number of respondents from the coastal areas due to their direct exposure and first-hand experience of the social and economic impact resulting from the operation of the Agus-1 Hydroelectric Power plant.

Demographic Profile of the Respondents

The study included a description of the respondent profile, encompassing age, sex, civil status, educational attainment, type of occupation, and length of residency. This demographic profile of the respondents played a crucial role in determining their ability to provide insights regarding the impact of the Agus-1 Hydroelectric Power plant. These insights were instrumental in developing socio-economic strategy measures and recommendations. The report indicates that the highest percentage of respondents fell within the age range of 18-35 years (86%), with a majority being female (75%). Additionally, 78% of the respondents were single, 57% had completed high school, 78.5% were unemployed, and 71.5% had resided in their area for 1 to 10 years.

It is important to note that the lack of occupation among the majority of respondents does not render the study findings null. As explained by Young, (2011), individual civic engagement choices play a vital role in understanding political activity and policy-making. While individuals with lower educational attainment may have lower incomes, they engage in different outlets for civic participation depending on their income levels. They may be less likely to be involved in political or government-based groups but more likely to participate in civic engagements such as churches or relief efforts.

He further emphasized that the absence of individual-level civic engagement hinders policy makers from comprehending a crucial aspect of the decision-making process, as assumptions are made about a silent constituency. Therefore, the findings of this study provide evidence of a non-discriminatory approach to respondent selection, regardless of employment status (employed, self-employed, or unemployed), as there was no need for such discrimination.

Socio-Economic Impact Assessment

Social Impact Assessments

To assess the social impact of the power plant, the following impact indicators are surveyed by the study: (a) A generally improved life, (b) an improved health, (c) attended seminars for social well-being conducted by the National Power Corporation (NPC), (d) commercial ventures developed by NPC, (e) preservation and improvement of the individual, community and cultural sites/heritage, (f) a program for disease control, (g) water quality monitoring, (h) monitoring of the dam, and (i) assessment of the experiences of the residents living near the lake.

Table 1 Assessment of Social Impact Indicator

Social Impact Indicators	VHI 1	HI 2	NI 3	LI 4	VLI 5	WM	Qualitative Description	Rank
The National Power Corporation helped me improve my well-being and acquire new financial resources	56	52	50	37	5	2.4	High Impact	1
My health improves, and the city's morbidity and mortality rates decrease	31	48	53	51	17	2.9	No Impact	3
I had the opportunity to attend a seminar hosted by the Municipality and the NPC that focused on self-awareness and other community issues, which helped improve my social well-being	23	28	38	49	62	3.5	Low Impact	7
The local government developed fishing, hunting, and commercial ventures to assist other residents and me in obtaining money resources	23	35	45	59	38	3.2	No Impact	6
According to the NPC and the local government unit, my community and other cultural sites in the city are not affected by the planned restoration of the Agus phase I	23	43	78	41	15	2.9	No Impact	3
The local government and National power corporation were operating and designing a program that decreases habitat for disease vectors.	15	37	65	52	31	3.2	No Impact	6
The National Power Corporation and the local government create a communication plan to assess the resident's experience near the Hydroelectric power plant	30	35	60	53	22	3.0	No Impact	4

There is a regular monitoring result to ensure that the Hydroelectric power plant Agus 1 was safe and clean for domestic use	36	63	48	38	15	2.6	No Impact	2
The local government conducted an inventory on the effect of the Agus Phase I on the life of the residents and checked all the details of the dam to make sure that it was safe	30	29	74	42	25	3.0	No Impact	4
After the Hydroelectric power plant, Agus phase 1 built the cultural heritage of the resident developed and improved	17	38	75	53	17	3.1	No Impact	5
Total Weighted Mean	3.0						No Impact	

Based on the survey, only one of the areas was rated *high impact*, where in the respondents answered that NPC helped them improve their life and helped them acquire new financial resources; however, when asked to identify for a specific aspect that was improved in their life, most of the respondents rated a *no impact* in terms of the other areas mentioned above. This was reflected in the results of the survey that obtained an overall assessment of *no impact*.

The item number 1 ranked first with a verbal interpretation of *high impact* which is equivalent to 2.4. This item stated that “The National Power Corporation helped me improve my life and helped me acquire new financial resources”. It can be inferred from this finding that indeed the residents had improved their social life through their experience of having electric resources, which helped increase their income. In fact, Participant 10 of the Focus Group Discussion stated that:

“Access to electricity has improved the lives of the people served by the energy generated by Agus 1. With access to electricity, people are motivated to purchase appliances and equipment that are used for productivity, and income generating activities such as refrigeration for cold storage of foods and beverages sold in stores and water pumps for farming and irrigation”.

Meanwhile, item 8 ranked second with the scale of 2.66, obtaining a verbal interpretation of *No impact*, which stated that “There is a regular monitoring result to ensure that the water was safe and clean for domestic use”. With the *No impact* result of this item of the survey, it can be interpreted that in terms of regular monitoring of the hydro power plant system, the resident has a low or no expectation with the National Power Corporations.

In addition, item number 3 that states “I had the opportunity to attend a seminar hosted by the City Government and the NPC that focused on self-awareness and other community issues, which helped improve my social well-being” obtained an equivalent scale of 3.5 and a description of “*Low Impact*”. This indicates that there may be no social activities conducted by the authorities who could have helped improve the social well-being of the stakeholders and the consumers. Also, it can be interpreted as that most of the respondents did not experience attending any seminars that focus on the management and current situations of the Agus Phase I.

In the FGD, when the participants were asked whether they have attended any seminars, communication dialogues or any of the programs hosted by the local government or the NPC that focused on the self-awareness and other community issues, only one out of the ten participants responded yes. This shows a very minimal efficiency of the transfer of information among the stakeholders and the consumers. Further, the items that fall under the lowest rank got the scale of 3.27, equivalent to “*No impact*” which stated that “The local government developed fishing, hunting and commercial ventures to assist other residents and obtaining money resources”.

As per the Department Administrative Order - 2000-81 issued by the Environment Management Bureau, and in accordance with the implementation of Republic Act 8749, also known as The Philippine Clean Air Act, (1999) the operation of Agus Phase 1 is linked to the enforcement of rules and regulations that align with the national policy of balancing development and environmental protection. This is achieved through the pursuit of sustainable development frameworks. As such Sustainable development, as defined in the DENR Administrative Order No. 2000-81 (2000), refers to a development approach that fulfills the present needs without compromising the ability of future generations to meet their own needs.

Based on the available information, it can be deduced that the Agus 1 Program and its implementation did not effectively contribute to the improvement of the residents' social well-being or provide successful programs for the betterment of future generations. According to the research conducted by Hansel and Metillo, (2016), several management plans were devised, and certain projects were initiated, including the Lake Lanao Watershed Protection and Development Council, Integrated Development Plan, Food and Agriculture Organization Environmental Management Plan, USAID-EcoGov pilot project on Forest Land Use Planning, and an Asian Development Bank Integrated Natural Resources and Environment Project, which encompassed the Agus 1 project. However, Hansel and Metillo, (2016) highlighted that these initiatives were hindered by budgetary constraints and/or political circumstances, resulting in their non-implementation or incomplete execution.

Economic Impact Assessment

To assess the economic impact of the power plant, the indicators that were covered in the survey include: (a) Reduced expenses; (b) maintenance of services leading to commercial success of the residents; (c) opportunity to explore income generating potential; (d) infrastructure development and resettlement; (e) financial opportunities from commercial ventures led by LGU; (f) compensation of the commercial establishments; (g) preservation of traditional land; (h) provision of homes by LGU after the Marawi Seige; (i) establishing cultural museums; (j) opportunities to generate profit.

Table 2 Assessment of Economic Impact Indicators

Economic Sustainability	VHI 1	HI 2	NI 3	LI 4	VLI 5	WM	Qualitative Description	Rank
Since we have sustainable electrical resources after the construction of Agus phase I, my family and I are able to reduce all of our expenses	57	39	28	47	29	2.8	No Impact	3
Electricity maintenance in Marawi City assists me in integrating commercial success	41	60	17	64	18	2.8	No Impact	3
The designation of electricity helps me to explore my income generating potential	56	53	31	39	21	2.6	No Impact	1
After the construction of Hydroelectric power plant Agus 1, it leads to the enhancement of municipal infrastructures or created new ones in resettlement areas	36	50	60	45	9	2.7	No Impact	2
The local government developed a commercial venture that expanded the financial opportunities of the residents	22	40	49	44	45	3.3	No Impact	7
The Local government Assists the relocation and compensation of fixed commercial establishments (tourists' camps, etc.)	33	38	69	37	23	2.9	No Impact	4
Local government unit Ensure preservation of traditional land uses for aboriginal peoples (e.g., hunting, fishing, trapping, gathering, burial sites)	29	36	53	37	45	3.2	No Impact	6
Residents that were displaced as a result of the Agus Phase I construction were given a new home	19	22	89	20	50	3.3	No Impact	7
Municipality create archaeological or cultural museums or establish points of interest, including lookouts	36	23	73	34	35	3.0	No Impact	5
The creation of Hydroelectric power plant Agus 1 gives the resident more opportunity to do small business to generate profit	24	45	66	44	21	3.0	No Impact	5
Total Weighted Mean	3.0						No Impact	

The overall assessment of the study is that there is no impact observed by the respondents in terms of having their economic lives improved by the development of Agus 1 Phase. However, this result only shows the general impression, because among the areas mentioned, a number of the respondents still observed that their expenses are being significantly reduced with the services provided by Agus 1 Phase; this is reflected in the result of the survey for item 1, where many of the respondents rated a very high impact towards this area. In addition, 60 respondents rated a high impact for item 2, where "Electricity maintenance in Marawi city assists me in integrating commercial success".

Of the items, item 3 ranked first which presented a weak impact with equivalent scale of 2.6. It stated that "The designation of electricity empowers me to explore my income-generating potential", and a "No impact" verbal interpretation. As a result, the researcher inferred that the Agus Phase 1 power plant has a weak impact to the residents' economic lives. Although majority of the respondents chose *Very High Impact* in item number 3, the weighted mean result of the data came out with a rating of "No Impact" because evidently, the respondents cannot be completely represented by only considering the fifty-six respondents who answered *Very High Impact*. It is important to note that the total number of respondents is two hundred individuals which are in this case proven, randomly distributed among the other options in the survey questionnaires.

On the other hand, the second rank has a scale of 2.7 with a verbal interpretation of "No impact". It stated that, "After the construction of Agus 1 Phase I, it led to the enhancements of municipal infrastructure or created new resettlements". Majority of the respondents were unaware of the infrastructure and new resettlements resulting from the Agus 1 Phase 1 Power Plant. Most of

them did not notice any new structures in their area. Nonetheless, most respondents admitted that the electricity provided by the Agus Phase 1 power plant helps them reduce their expenses.

In the FGD, Participant 5 elucidated that;

"...most businesses operate with the supply of electricity, especially those who use electric machines."

Participant 6 also added that;

"... it (electricity) reduces the expenses since the source came from the water. Example is the bill of electricity, here in municipality of Marantao LDS we have free electricity bill."

The findings of this present study can be compared to the study of Nguyen et al., (2017). They found that residents of the Bo Hon villagers in Central Vietnam had recovered from the resettlement, and their income had improved after the construction and development of hydroelectric dams. While from the early years after displacement, more vulnerable households experience an improved quality of life. From these, it can be inferred that though the respondents of this study were unaware that they actually originated from resettlements for the purpose of the construction of the Agus 1 hydroelectric power plant, they experience the economic benefits brought by the power plant.

General Socio-Economic Impact Assessments

The operation of the Agus-1 Hydroelectric Power Plant necessitates the achievement and maintenance of a harmonious equilibrium between socio-economic growth and environmental preservation. The National Power Corporation, Department of Environment and Natural Resources, and other relevant government agencies are mandated to safeguard the Agus Pulangi River and Lanao River as the rights of the residents, aiming to establish a balanced and healthy ecology in alignment with the natural rhythm and harmony. The state is committed to promoting and safeguarding the global environment through sustainable development, while acknowledging the primary responsibility of local government units in addressing socio-economic issues. Therefore, there is a need for improvement and development in the policy implementation of the Agus Phase I Power Plant.

Thus, based on the results of the study, the followings were the general assessments of the study on the Socio-Economic Impact of Agus-1 Hydroelectric Power plant of which the mandated agencies were obliged to address for the sustainability of the Agus-1 Hydroelectric Plant:

Table 3 General Assessments of the Study on the Impact of Agus-1 Hydroelectric Power plant

Issues	Impact Assessment
<i>Public Involvement (Educational awareness)</i>	The majority of respondents in this study indicated a lack of knowledge or awareness regarding the programs, consequences, safety measures, and policies associated with the establishment of the Agus-1 Hydroelectric plant. They have not participated in or been exposed to any awareness programs conducted by the authorities on these matters
<i>Social and Community Development</i>	There was a hole on the programs of the government for the affected residents near Agus 1 to develop small ventures program to boost income of the citizens. Also, the power services from the Agus-1 failed to benefit majority of the citizens in their economic capacity due to the slow and unstable electricity management in the city. Lastly, the preservation of the cultural heritage and traditional land for aboriginal people was weak and inefficient.
<i>Public and Worker Health and Safety</i>	This study found out that the programs for the implementation for the health and safety for the citizens near Agus-1 were weak and inefficient as perceived by the impacted residents. There was no initiated program from the authorities to decrease disease vectors for the habitats around the Agus-1, and there was no regular monitoring and communication from authorities to ensure the well-being of the citizens and safety mechanisms of the Agus 1.

4. DEVELOPMENT OF STRATEGY MEASURES

A. In order to maintain the expression of commitment in genuine concern of the people welfare, the developed Strategy measures are the following:

Annually undertake information and education campaigns in different barangays near the Agus-1 Power Plant.

Conduct an annual seminar to be held with all the barangays in Marawi city with the assistance of the LGU and NPC to ensure compliance with the Presidential Decree 1586 environmental impact statement system and an environmental compliance certificate. Improve the information and data that the Agus-1 have, including the current situation of the electric power plant, and make it available to the public.

Consult with key stakeholders such as the NPC, LGUs, DENR, and NGOs to recognize any disagreeing demands through the community reliance on natural resources or conservation obligation that may exist in the area.

Implement a power conservation policy that will engage the residents and employees to exert an effort, in order to reduce the amount of energy they use in their daily activities.

B. In order to efficiently implement a pro-active program in the social and community development, the developed Strategy measures are the following:

Require residents near the Agus 1 hydroelectric power plant to contribute to an Agus 1 livelihood initiative, as suggested by the National Power Corporation. Tourism, fishing, and other industries may be involved.

Develop a tourist spot that can display the cultural heritage site and tribal practices of the residence near Agus-1.

The NPC, LGU's, and Barangay Officials should establish an Electrification Program to prioritize barangay electrification in socially important areas and economic development areas, among the un-electrified areas.

Increase the trainings and seminars in utilizing the domestic energy production of Marawi city through (e.g., Computer related business-like printing shop, Water refilling business that used pumps, etc.)

Establish a citizen's loan program encouraging small entrepreneurship activities within the areas near the Agus-1 to start a business, wherein tips on paperwork and funds are provided in a short time to boost the economic potentials in the area.

In case of any needs for labour force in the Agus-1 power plant, require the construction contractors to prioritize the recruitment of local labor coming from the residents around the area and provide stability support allowance for them.

Ensure preservation of traditional land use for aboriginal people.

Hold a training and seminar for residents, focusing on their culture and livelihood program that could result into residents having new financial resources aligned with their culture.

Promote efforts for entrepreneurship development by way of more conventional livelihood restoration support and vocational trainings for job change and improvement.

Develop a cultural museum to improve tourist attractions, or establish a point of interest that will help the residents acquire a new financial resource.

C. In order to provide a safe and sound health to the public and the workers of the plant, the developed Strategy measures are the following:

Conduct a regular check-up of the Agus-1 worker's living quarters to reduce the potential transmission of communicable respiratory diseases or food-related illnesses which may be transferred to local communities from the power plant.

Develop a regular education program or campaign to sensitize community residents about the risks of drowning during floods in the upstream perimeter of Agus-1.

It is through this strategies that the government shall maintain the implementation of comprehensive, computerized programs that can monitor and analyze the impacts of the operations and its contributions to the long term economic and social well-being of host communities and the surrounding areas of Agus 1 Phase 1 Hydro-electric Power plant.

5. CONCLUSIONS AND RECOMMENDATIONS

The investigation revealed a significant deficiency in the transfer of information from the Agus 1 power plant management to the residents. A majority of the respondents expressed a lack of awareness regarding the Agus 1 programs and management regulations. The residents living near the dam had not participated in any seminars organized by the local government unit or the national power corporation to educate them on the operation of Agus Phase 1. This indicates inefficiency in the policies implemented by the NPC and Marawi city's LGU, resulting in minimal impact from the operation of the Agus phase 1 power plant.

Therefore, it is imperative for the local government unit to make a concerted effort to conduct seminars in various barangays. These seminars should educate residents and barangay leaders about the significance of Lake Lanao and the Agus-1 Power Plant within their community, aiming to enhance their participation and involvement in environmental preservation. The National Power Corporation is encouraged to provide up-to-date baseline data and information on the current state of the Agus Phase 1 Power Plant to inform and engage the residents effectively. To achieve this, the LGU, NPC, and NGOs must allocate sufficient resources to

support these programs and establish effective communication channels with different organizations, ultimately improving the socio-economic well-being of the residents.

Acknowledgement

The author would like to acknowledge the financial support for the research and publication of this article:

- a) This work was supported by the DOST – Engineering Research and Development for Technology (ERDT) Scholarship.
- b) Mindanao State University – Marawi city, APDP Faculty Development Program

Informed consent

Not applicable.

Ethical approval

Not applicable.

Conflicts of interests

The authors declare that there are no conflicts of interests.

Funding

The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Effendi A. The Effectiveness of Fishbowl Technique Towards Students' Self Efficacy in Speaking. *J Lang Lang Teach* 2018; 5 :46. doi: 10.33394/jollt.v5i2.345
2. Hansel C, Metillo E. Efforts towards the management of Lake Lanao and its watershed. *IAMURE Int J Ecol Conserv* 2016; 18 :170-199. doi: 10.7718/ijec.v18i1.1116
3. Nguyen H, Ty P, Bruyn LL. Impact of Hydroelectric Dam Development and Resettlement on the Natural and Social Capital of Rural Livelihoods in Bo Hon Village in Central Vietnam. *Sustainability* 2017; 9(8):1422. doi: 10.3390/su9081422
4. Philippine Clean Air Act (RA 8749). Formulation of a holistic national program of air pollution management and encourage cooperation and self-regulation among citizens and industries through market-based instruments 1999.
5. Scudder T. Development-induced community resettlement. *New Directions in Social Impact Assessment: Conceptual and Methodological Advances* 2011; 186-201.
6. Young E. The Impacts of Educational attainment, Professional Interests, and Residency on Community Involvement and Civic Engagement. *Colonial Academic Alliance Undergrad Res J* 2011; 2:4.